

SYSTEM AND METHOD FOR
CREATING A CUSTOM ARTICLE

Field

5 The present application relates to a system and method for creating a custom article and, more particularly, to a system and method for creating custom lasts used to make custom shoes.

Background

10 A shoe last is a solid form around which a shoe is molded. Shoe lasts are utilized by shoemakers to construct shoes. The fit of a shoe depends on the design, shape and volume of the shoe last. The shoe last represents the anatomical information of the foot and is designed for a particular heel height and toe
15 shape. A shoemaker's shoe last collection typically includes many different styles of shoe lasts, i.e., different heel heights and toe shapes, whereby for each shoe last style the shoemaker will often have a complete size run. Traditionally, shoe lasts were made of hardwoods, such as maple or beech.
20 Modern day shoe lasts, however, are constructed of high-density plastics.

Many styles of shoes can be made on the same shoe last, but the toe shape and heel height will be the same for each pair of shoes made on that shoe last. Toe shapes can be, for instance,

round, pointed or squared. If shoes with different toe shapes are desired, then different shoe last styles need to be used.

The shoe lasts in a shoemaker's last collection were at some point in the past developed by referring to a foot of one 5 or more individuals. Once these shoe lasts are developed, however, shoes are mass-produced from these shoe lasts and sold, for example, at retail stores.

Custom shoes are also made from shoe lasts. One known method of making custom shoes for a person involves scanning the 10 person's feet. Based on the results of the scan, a previously manufactured shoe last is manually modified and thus created for each foot of the particular person. In particular, the previously manufactured lasts can be modified, for instance, by sanding or by adding man-made materials to the lasts.

15 Alternatively, the shoe lasts can be made by first creating molds of a person's feet using putty or a plaster cast. From these molds, lasts are made in either plastic or wood. To further refine the lasts or change the toe shapes the lasts would be either sanded down or increased using man-made 20 materials. Another known method for making custom shoes involves the use of previously manufactured lasts and manually measuring a person's foot using a tape measurer. Similar to the above-described known method for making custom shoes, man-made

materials are then used to improve and reshape manufactured lasts to the required measurements. When another person desires a pair of custom shoes, however, one of the above-processes for producing the respective lasts is repeated.

5 A need exists for refining the system and method for manufacturing custom shoe lasts. For instance, there is a need to develop custom shoe lasts from template lasts and associated test shoes that have previously been confirmed by an individual as having a proper fit. There is also a need to calculate shoe
10 last measurements in smaller increments such as millimeters. Additional needs are addressed by the exemplary embodiments of the present application.

Summary

15 An aspect of the present application provides for a method for developing lasts. The method comprises developing a last and a test shoe from the last for an individual, the test shoe meeting at least one predetermined criteria based on feedback from the individual, determining at least one measurement of the
20 developed last, storing the at least one measurement, developing another last for another individual by modifying the stored at least one measurement.

Another aspect of the present invention provides for a method for developing lasts. The method comprises developing a last and a test shoe from the last for an individual, determining at least one measurement of the developed last, 5 storing the at least one measurement, and developing a plurality of lasts for a plurality of respective other individuals by referring to the stored at least one measurement.

A further aspect of the present application provides for a method for developing custom lasts. The method comprises 10 developing a pair of template lasts for an individual, developing a pair of test shoes meeting at least one predetermined criteria from the pair of template lasts, measuring feet of the individual to determine a first plurality of measurements, measuring feet of a customer to produce a 15 second plurality of measurements, comparing the first plurality of measurements and the second plurality of measurements to determine at least one adjustment measurement, and developing a pair of custom lasts by modifying the pair of template lasts according to the at least one adjustment measurement.

20 A still further aspect of the present application provides for a method for developing a pair of custom shoes for a customer. The method comprises (a) determining a first plurality of measurements by measuring a base last, (b) storing

the first plurality of measurements, (c) determining a second plurality of measurements by measuring at least one foot of an individual, (d) storing the second plurality of measurements, (e) developing a pair of template lasts, (f) developing a pair 5 of test shoes from the pair of template lasts, the test shoe meeting at least one predetermined criteria based on feedback from the individual, (g) storing a third plurality of measurements associated with the pair of template lasts, (i) determining a fourth plurality of measurements by measuring a 10 left foot and a right foot of a customer, (j) storing the fourth plurality of measurements, (k) determining a plurality of adjustment measurements by comparing the second plurality of measurements to the fourth plurality of measurements, (l) developing a pair of custom lasts associated with the customer 15 according to the plurality of adjustment measurements by modifying either the base last or the pair of template lasts, and (m) developing the pair of custom shoes from the pair of custom lasts.

20 Brief Description of the Drawings

Fig. 1 illustrates an exemplary system of the present application;

Figs. 2a and 2b illustrate exemplary flow diagrams for developing a template last from a base last;

Fig. 3 illustrates an exemplary flow diagram for developing custom lasts and corresponding custom shoes for a customer;

5 Fig. 4a illustrates an exemplary women's shoe having a 50mm heel;

Fig. 4b illustrates an exemplary women's shoe having no heel;

Fig. 4c illustrates an exemplary women's shoe having a 90mm heel;

10 Fig. 4d illustrates an exemplary women's shoe having a 120mm heel;

Fig. 5a illustrates a prospective view of an exemplary left foot of a customer;

Fig. 5b illustrates a bottom view of the exemplary left foot shown in Fig. 5a;

15 Fig. 6 illustrates an exemplary test shoe and a corresponding template last and base last used to manufacture the exemplary test shoe;

Fig. 7a illustrates several exemplary measurements associated with the customer's foot depicted in Figs. 5a and 5b and the customer's right foot;

20 Fig. 7b illustrates other exemplary measurements associated with another customer's feet; and

Fig. 8 illustrates an exemplary template last and base last and adjustments made thereto for developing a custom last.

Detailed Description

5 According to the exemplary embodiments described in the present application, custom lasts and custom shoes are manufactured for a customer. Specifically, the customer can select, for example, any style, color, fabric and heel size/type for a pair of shoes, and since exemplary customer shoe

10 development system 100 has determined a plurality of measurements associated with the customer's left foot and right foot, a pair of custom shoes can be manufactured for that customer from a pair of custom developed lasts. In an exemplary embodiment, a customer's left foot and right foot only need to

15 be measured once as foot dimensions are assumed to not have changed over time, for example, if the customer is an adult. Alternatively, one or more additional measurements can occur, for instance, the customer's feet can be measured for every custom shoe order to confirm measurements have not altered over

20 time. The exemplary embodiments are equally applicable to women's shoes and men's shoes, whether heeled or flat. Further, custom children shoes can be manufactured according to the exemplary embodiments of the present application. However,

measurements of a child's feet are periodically determined due to growth.

Figure 1 illustrates an exemplary custom shoe development system 100 according to the present application. System 100 includes main facility 110 coupled to remote facility 105 via data communication link 155. Main facility 110 is also coupled to last manufacturer 115 and shoe manufacturer 120 via data communication link 155. Alternatively, last manufacturer 115 and/or shoe manufacturer 120 can be coupled to main facility 110 by a separate data communication link not shown in the drawings. Data communication link 155 can be any wired or wireless communication link operable to transmit voice, images and/or text data between at least any two respective points. Physical objects such as lasts, shoes, documents and the like can also be transmitted amongst main facility 110, remote facility 105, last manufacturer 115 and shoe manufacturer 120.

Main facility 110 includes scanning unit 140, processing unit 145 and memory unit 150. At main facility 110, scanning unit 140 is operable, for example, for scanning base lasts and feet to be used for developing template lasts, described in more detail herein. Data resulting from such scans, as well as other data described herein, are stored in memory unit 150 by processing unit 145.

Remote facility 105 includes scanning unit 125, processing unit 130 and memory unit 135. At remote facility 105, scanning unit 125 is operable, for example, for scanning the feet of a customer desiring a pair of custom shoes. Data resulting from 5 such a scan is stored in memory unit 135 and/or in memory unit 150 with or in association with any other data regarding the respective customer. Memory unit 150 and memory unit 135 can each include one or more memory units coupled together and are not limited to any particular type of storage medium. Memory 10 units 150 and 135 can be internal to the respective processing unit and/or the respective scanning unit, or external thereto. For instance, memory unit 150 and memory unit 135 can be one or more databases, relational or otherwise. Based on the scanned measurements of a customer's feet at remote facility 105, custom 15 lasts are manufactured at last manufacturer 115 and custom shoes based on those custom lasts are developed at shoe manufacturer 120, as described in more detail herein. Last manufacturer 115 and shoe manufacturer 120 also manufacture template lasts and test shoes, respectively, which can be referred to in order to 20 manufacture a pair of custom shoes according to the exemplary embodiments of the present application.

Scanning unit 140 and scanning unit 125 can be any device operable to produce measurements of a customer's feet in three

dimensions, for instance, a laser scanner, a photographic scanner, a last measurement tool or the like. For example, the PEDUS 3D foot scanner sold by Human Solutions of North America, Inc. could be used for scanning unit 140 and/or scanning unit 5 125. Furthermore, the present application is not limited to having one or more separate scanning units located at main facility 110 and remote facility 105. Rather, one or more scanning units and/or one or more devices associated with the one or more scanning units can be located at main facility 110 10 or at remote facility 105. Also, multiple remote facilities can be included in exemplary system 100 with or without a scanning unit and/or with or without one or more other devices associated with the scanning unit.

The components of Fig. 1 may be implemented through 15 hardware, software, and/or firmware. The components in system 100 are not limited to those illustrated.

Figures 2a and 2b illustrate exemplary flow diagrams for developing template lasts from a base last. A template last and/or a base last is used as a reference for developing custom 20 lasts and custom shoes for customers, described in more detail herein with reference to Figs. 3-8.

In an exemplary embodiment, a base last is referred to when developing template lasts and, more particularly, the

measurements associated with the base last. The base last, or a plurality of base lasts, can be selected, designed and/or developed by, for example, a designer and/or a shoe last manufacturer working together or alone on the end shape. Each 5 base last corresponds to a particular shoe size and has its own style which determines the heel height and toe shape. The exemplary embodiments of the present application, however, are described with reference to the women's size 38 base last 615 shown in Fig. 6 having a particular toe style and heel height 10 for manufacturing size 38 women's shoes. As will be appreciated by a person having ordinary skill in the art, the size and style of the base last, as well as the size and style of the template last and custom last, are merely illustrative for the exemplary 15 embodiments are equally applicable to different sizes and styles.

As depicted in Fig. 2a, base last 615, for instance, is measured, for example, in millimeters at main facility 110 by processing unit 145 using scanning unit 140, in 205. From this 20 scan, a plurality of different base last measurements, for instance, twenty measurements, are taken in millimeters. These base last measurements include, for example, last length, ball girth which is a circumference measurement, ball width, toe height, toe girth/circumference, toe width, heel width, heel

height or heel curve height, heel pitch, 60% ball girth, 60% ball width, 65% ball girth, 65% ball width, 70% ball girth, 70% ball width, 75% ball girth, 75% ball width, 80% ball girth, 80% ball width, instep girth or arch width and instep height or arch 5 depth. In the above exemplary measurements, the enumerated percentage is taken from the total measurement of the last (or foot) from the longest point on the last (or toe) to the heel point. Ball girth refers to circumference measurements of a foot or last. Therefore, X% ball girth refers to the 10 circumference measurement at a point on the foot or last that is at X% distance from the total measurement of the foot or last. For example, if a foot or last is 250mm in total length, 60% of this measurement is 150mm. Hence, ball girth is determined at a point that is 150mm from the heel point. Alternatively, 15 measurements points can be determined from the tip of the longest toe, as opposed to from the heel point. Also, as would be appreciated by a person having ordinary skill in the art, the ball girth percentages are merely exemplary. More or less ball girth measurements can also be determined. Figures 5a and 5b 20 illustrate the above-enumerated exemplary measurements taken, however, of a foot. One or more of these measurements is taken of a base last, for instance, base last 615, as described

herein. Figure 6 depicts an exemplary heel pitch measurement of x for base last 615.

The base last measurements determined by scanning unit 140 and processing unit 145 are stored in memory unit 150 for future 5 reference by processing unit 145, in 210. In an exemplary embodiment, an image of base last 615 (and/or template last 610) is also generated using a computer aided design ("CAD") software program or the like and stored in memory unit 150 for later manipulation manually by an operator and/or automatically by 10 processing unit 145. CAD software programs are well known and are thus not described in detail herein. Based on these measurements, base lasts can be scaled to the millimeter or smaller instead of the traditional size scale and run.

In order to develop one or more template lasts from a 15 respective base last that can be used by system 100 to develop custom lasts, an individual is selected as a test case. Any individual capable of providing feedback can be selected for participating in the development of the test shoes and associated template lasts. For instance, the individual can be 20 a woman having size 38 feet.

The individual's left foot and/or right foot are scanned by scanning unit 140 at main facility 110, in 215. From this scan, a plurality of different template feet measurements, for

example, twenty measurements, are taken in millimeters for one or both of the individual's feet. These template feet measurements can include, for example, foot length, ball girth, ball width, toe height, toe girth/circumference, toe width, heel 5 width, heel height or heel curve height, 60% ball girth, 60% ball width, 65% ball girth, 65% ball width, 70% ball girth, 70% ball width, 75% ball girth, 75% ball width, 80% ball girth, 80% ball width, instep girth or arch width and instep height or arch depth. Figures 5a and 5b illustrate these exemplary 10 measurements taken of a customer's foot. One or more of the above-enumerated template feet measurements is similarly taken of the individual's feet, as described herein. It should be noted that a heel pitch measurement need not be taken if the respective foot is resting on a flat surface since the heel 15 pitch measurement will be equal to zero. The template feet measurements are stored in memory unit 150, in 220.

The timing associated with determining and storing the individual's measurements is not meant to be limited to after determining and storing base last measurements in 205 and 210 20 and before developing test shoes and associated template lasts in 225. Similarly, the timing associated with determining and storing base last measurements in 205 and 210 is not meant to be limited to before determining and storing an individual's

measurements in 215 and 220 and before developing test shoes and associated template lasts in 225.

Once the individual has been selected, one or more pairs of test shoes are developed from base last 615 and template last 5 610 for the individual, in 225, which is described herein in more detail with reference to Fig. 2b. For purposes of explanation only, as described above, the exemplary embodiments of the present application are described and illustrated based on the size 38 template last 610 depicted in Fig. 6 being 10 manufactured by last manufacturer 115 from base last 615. As can be seen in Fig. 6, base last 615 and template last 610 is used to manufacture a particular style shoe having a particular size --test shoe 605. The exemplary embodiments are equally applicable to other styles and sizes of base lasts, template 15 lasts and corresponding test shoes manufactured from the base lasts and/or template lasts.

Based on the size of the individual's feet, determined either by asking the individual, manually measuring the feet or foot of the individual, electronically measuring the 20 individual's feet or foot or the like, a base last is selected from the existing size run that has the closet measurements to the individual's feet or foot. For instance, size 38 base last 615 is selected by shoe manufacturer 120. In an exemplary

embodiment, there is a 6.66mm difference between the length of each base last. Using base last 615, shoe manufacturer 120 makes a first pair of test shoes, one of the test shoes being test shoe 605, in 230.

5 The pair of test shoes are then tested by the individual, for instance, to determine whether at least one predetermined criteria is satisfied in 235. The at least one predetermined criteria confirms a proper fit such as comfort and balance or the appropriate center of gravity. In an exemplary embodiment, 10 the individual is asked to respond to at least one question regarding the test shoes in order to determine whether the at least one predetermined criteria is satisfied. The following is merely a list of some exemplary questions that can be presented to the volunteer: "How does the length of your foot feel?"; "How 15 do your toes feel?"; "How does the width of your foot feel?"; "How does the heel of your foot feel?"; "How does the arch of your foot feel?"; "How does the balance feel?"; "How does the ball of your foot feel?"; and "How does your ankle feel?". The same question or questions can be asked for both feet. The 20 substance of these questions can be phrased in a variety of ways and different questions can also be presented to the individual in addition to or in place of one or more of the above-enumerated questions. The individual is asked to wear and use

the pair of test shoes for a particular amount of time, for example, for four to eight hours. After the particular amount of time has expired, the individual can again be asked one or more of the questions previously asked and answered. This 5 process can even be repeated one or more times, if desired.

In an exemplary embodiment, a shoe is balanced when there is an equilibrium of measurements. For instance, for a shoe to be balanced, the distance from the toe of the shoe to the widest measurement needs to be correct, the distance from the widest 10 measurement to the heel of the shoe needs to be correct and the relation between the height of the heel of the shoe to the length of the shoe needs to be correct. If the shoe heel is too high or too short for the length of the shoe, then walking is quite difficult if not impossible. If the proportion of the 15 toe-width measurement is too short or too long, then the arch of the foot is either pushed up or the foot slides too far forward making walking uncomfortable. If the width of the shoe and the heel are not aligned correctly, a foot will turn in or out. Improper balance can be determined in a variety of ways. For 20 example, by feedback from the individual, by visually observing tension in the feet of the individual and the area around the individual's ankles, and/or by visually observing the wearing of the soles of the test shoes. Electronic sensors can also be

used to determine tension in the feet of the individual and the area around the individual's ankles. If the test shoes are confirmed to be a proper fit in 235 so that comfort is achieved, the base last measurements associated with base last 615 are 5 stored in memory unit 150, in 250. These stored base last measurements are considered by system 100 to be the template last measurements. If the test shoes 605 are determined, however, not to be a proper fit in 235, a pair of modified base lasts are developed by last manufacturer 115, in 240.

10 In particular, according to the feedback obtained from the individual by answering one or more of the above-enumerated questions, at least one adjustment is made to the base last measurements for the left foot and/or the base last measurements for the right foot. Data regarding any adjustments is then 15 transmitted by processing unit 145 to last manufacturer 115 via data communication link 155 or last manufacturer is orally informed of any adjustments. As a result, last manufacturer 115 modifies the base last for the left foot and/or the base last for the right foot accordingly by either increasing or 20 decreasing, for example, to the millimeter, one or more measurements associated with the base lasts.

In an exemplary embodiment, at least one of the following five adjustments are made by last manufacturer 115 to one or

both of the base lasts: an adjustment to the length of a respective base last; an adjustment to the width of a respective base last; an adjustment to the ball girth of a respective base last; an adjustment to the ball width of a respective base last; 5 and an adjustment to the heel height of a respective base last. The present application is not meant to be limited to these adjustments, as they are merely exemplary. For instance, one or more other adjustments can be made to a respective base last such as toe height, toe girth/circumference, toe width, heel 10 width, heel height or heel curve height, heel pitch, 60% ball girth, 60% ball width, 65% ball girth, 65% ball width, 70% ball girth, 70% ball width, 75% ball girth, 75% ball width, 80% ball girth, 80% ball width, instep girth or arch width and instep height or arch depth.

15 Last manufacturer 115 forwards the modified base last(s) to shoe manufacturer 120. Shoe manufacturer 120 then makes another test shoe(s) from the modified base last(s), in 245. The test shoes are again tested by the individual as described above, in 235. Based on the individual's feedback either a proper fit is 20 confirmed or the process repeats one or more times as necessary. In any event, the modified base last measurements associated with the test shoes that eventually are confirmed as having the proper fit are stored in memory unit 150, in 250. These stored

base last measurements are referred to as the template last measurements in the present application. Figure 6 illustrates exemplary template last 610 and the test shoe 605 developed from template last 610.

5 In an exemplary embodiment of the present application, multiple template lasts can be manufactured as described herein, each template last being associated with a different shoe style, i.e., heel size and toe style. These multiple template lasts, however, are developed using the same individual or different 10 individuals each having the same size feet, for instance, size 38. Accordingly, depending on the custom shoe selected by a customer, the respective template last or base last is referenced for manufacturing the appropriate custom last. Alternatively, multiple template lasts are developed from 15 different individuals having different feet sizes. As a result, depending on the custom shoe selected by a customer and the size of the customer's feet, the respective template last or base last having the closest size is referenced for manufacturing the appropriate custom last.

20 Because a customer can select a pair of custom shoes having a particular heel pitch and heel height, as described below, a template last will have already been made, i.e., a base last will have already been modified accordingly, as described above,

to accommodate that heel pitch and heel height. Heel pitch refers to the angle of the heel in relation to the last. In an exemplary embodiment, the following is taken in consideration when developing each template last and the associated test shoe, 5 for example: as a foot rises due to heel height, the distance between the ball of the foot and the heel shortens; a foot needs different support as the heel rises; and in general, a higher heel shoe is narrower at the toe than a flat shoe.

Figure 3 illustrates an exemplary flow diagram for 10 developing a pair of custom shoes for a customer. In order for a pair of custom shoes to be manufactured for a customer, the customer has to first choose the desired shoe from a shoe collection, for example, from an exemplary shoe collection as illustrated in Figs. 4a...4d. Fig. 4a depicts a particular style 15 of a women's shoe having a 50mm heel, Fig. 4b illustrates a particular style of a women's shoe having no heel, also referred to as a flat, Fig. 4c illustrates a particular style of a women's shoe having a 90mm heel and Fig. 4d illustrates a particular style of a women's shoe having a 120mm heel. In an 20 exemplary embodiment, the customer selects the shoe at remote facility 105, for instance, at a merchant, having scanning unit 125 located on the premises that is operable for scanning the feet of the customer. Alternatively, the customer can select

the shoe via an Internet website or over the telephone through a customer service representative or through an automated voice response unit associated with main facility 110 if the customer's feet have previously been scanned by scanning unit 5 125, scanning unit 140 or other scanning unit not shown in Fig. 1.

Besides the shoe style and heel height, the customer also has the ability to select the fabric, the color of the fabric, if applicable, accessory details, shoe back or strap and/or 10 embroidery or the like. In an exemplary embodiment, the customer has the ability to select any available shoe style and the desired heel height for that shoe style from a group of available heel heights. For instance, if a customer wants the custom shoe shown in Fig. 4b, i.e., the flat shoe, with a 50mm 15 heel, a 50mm template last or a 50mm base last would be used for manufacturing the custom lasts instead of a flat template last, and the design of the shoe shown in Fig. 4b along with the customer's measurements would be used. Alternatively, the customer can select any heel height and/or heel style for any 20 available shoe style. It is assumed for purposes of explanation that the customer has selected the shoe shown in Fig. 4d having a 120mm heel.

Before or after the customer selected the shoe shown in Fig. 4d, the customer's left foot 505 shown in Figs. 5a and 5b is measured, for example to the millimeter, by processing unit 130 and scanning unit 125, in 305. Figs. 5a and 5b only 5 illustrate a customer's left foot 505 for purposes of explanation. However, the same procedures described and illustrated herein regarding left foot 505 are the same for the customer's right foot. Both feet are measured, as a custom last is manufactured for each foot. These measurements are stored in 10 a personal customer file located in memory unit 135 and/or in memory unit 150 upon transfer to main facility 110, as described below. These measurements can include, for example, foot length 502, ball girth 504, ball width 506, toe height 508, toe girth/circumference 510, toe width 538, heel width 512, heel 15 height or heel curve height 514, 60% ball girth 518, 60% ball width 520, 65% ball girth 522, 65% ball width 524, 70% ball girth 526, 70% ball width 528, 75% ball girth 530, 75% ball width 532, 80% ball girth 534, 80% ball width 536, instep girth or arch width 540 and instep height or arch depth 542. As with 20 the template feet measurements used for developing a template last, a heel pitch measurement need not be taken if the respective foot is resting on a flat surface since the heel pitch measurement will be equal to zero. Exemplary measurements

for left foot 505 and the right foot are illustrated in Fig. 7a. Figure 7b illustrates exemplary foot measurements for another customer having feet with substantially different measurements. As will be appreciated by a person having ordinary skill in the 5 art, it is not uncommon for a person's feet to have different measurements.

The customer measurements are transmitted by processing unit 130 to processing unit 145 where the customer measurements are evaluated by one or more individuals and/or by processing 10 unit 145 to confirm that the transmitted data is sufficient to create a custom last for left foot 505 and a custom last for the right foot, in 310. Also, data regarding the selected pair of custom shoes, for example custom shoe 420 shown in Fig. 4d, is transmitted to main facility 110 before, with or after the 15 customer's measurements are transmitted. The customer measurements and the data regarding the pair of custom shoes are stored in memory unit 150 in one or more personal data files associated with the customer for later retrieval, in 315.

The data indicating the customer's measurements and 20 selected custom shoe 420 stored in memory unit 150 is retrieved by processing unit 145. Processing unit 145 also retrieves from memory unit 150 data regarding an individual's left template foot measurements or an individual's right template foot

measurements, the test feet of the individual having been used to develop a specific pair of test shoes including test shoe 605 and associated template last 610 as described herein. Alternatively, measurements for both of the individual's test 5 feet are retrieved from memory unit 150. Processing unit 145 then compares the individual's left template foot measurements and/or the individual's right template foot measurements to the customer's left foot measurements and/or the customer's right foot measurements, respectively, to determine adjustment 10 measurements, in 320.

Since the same or similar measurements were taken for the individual's test feet and the customer's feet, the results of one or more of the following measurements are compared, in 320: foot length, ball girth, ball width, toe height, toe 15 girth/circumference, toe width, heel width, heel height or heel curve height, 60% ball girth, 60% ball width, 65% ball girth, 65% ball width, 70% ball girth, 70% ball width, 75% ball girth, 75% ball width, 80% ball girth, 80% ball width, instep girth or arch width and instep height or arch depth. For example, if 20 foot length 502 of the customer's left foot 505 was determined to be 250.34mm, as depicted in Fig. 7a, and the corresponding measurement for the left test foot or the right test foot of the individual was determined to be 241.77mm, processing unit 145

determines this adjustment measurement to be 8.57mm. This is repeated for the length of the customer's right foot. The adjustment measurements relating to length are stored in the customer's personal data file located in memory unit 150, in

5 325. Similar comparisons are made of one or more of the other above-enumerated measurements for both of the customer's feet and the respective adjustment measurements are stored in memory unit 150. The present application is not meant to be limited to the above-enumerated measurements, as they are merely exemplary.

10 Upon the adjustment measurements being determined by processing unit 145, data indicating the adjustment measurements that is needed to manufacture custom lasts for the left foot 505 and for the right foot is then transmitted by processing unit 145 to last manufacturer 115 via data communication link 155.

15 As a result, last manufacturer 115 can develop custom last 805 for each of the customer's feet, in 330, as shown in Fig. 8. In an exemplary embodiment, last manufacturer uses template last 610 to develop custom last 805 for each of the customer's feet, as template last 610 corresponds to the custom shoe selected by 20 the customer, i.e., custom shoe 420 shown in Fig. 4d. Template last 610 can be stored at last manufacturer 115, or at main facility 110 and provided to last manufacturer 115, and selected from a library of template lasts. Based on the adjustment

measurements, last manufacturer 115 modifies two template lasts (template last 610), one template last for the customer's left foot 505 and one template last for the customer's right foot. For example, since adjustment measurement for foot length was 5 determined to be 8.57mm as described above, last manufacturer 115 increases the length of template last 610 for left foot 505 by 8.57mm. Similar modifications, whether adding to or decreasing from the size of the respective template last, are made for any other adjustments measurements. Since it was 10 previously determined that test shoe 605 made from template last 610 properly fit the individual used for testing purposes, the custom shoe made from template last 610 will also properly fit the customer.

Figure 8 illustrates several adjustments to template last 610 (or base last 615 described below) to construct custom last 805, including adjustments to last length, ball girth and ball width. More or less adjustments can be made depending on the difference between the customer's measurements and the template feet measurements. In an exemplary embodiment, custom lasts are 20 created in either plastic or wood. However, as will be appreciated by a person having ordinary skill in the art, various other materials or combinations of materials can be used to construct a last. Alternatively, last manufacturer 115 can

use an appropriate base last, for example, base last 615, to develop custom last 805 for each of the customer's feet, as base last 615 was used to develop template last 610 and corresponds to the custom shoe selected by the customer, i.e., custom shoe 5 420 shown in Fig. 4d. Base last 615 can be stored at last manufacturer 115, or at main facility 110 and provided to last manufacturer 115, and selected from a library of base lasts. Based on the adjustment measurements, last manufacturer 115 modifies two base lasts (base last 615), one base last for the 10 customer's left foot 505 and one base last for the customer's right foot. For example, since adjustment measurement for foot length was determined to be 8.57mm as described above and assuming the length of base last 615 had to decreased by 1mm according to the feedback from the individual used for test 15 purposes, last manufacturer 115 increases the length of template last 610 for left foot 505 by 7.57mm, instead of 8.57mm when using template last 610. The adjustment measurement regarding the length 502 of left foot 505 sent to last manufacturer 115 would therefore be 7.57mm. Similar modifications, whether 20 adding to or decreasing from the size of the respective base last, are made for any other adjustments measurements.

Each pair of custom lasts are assigned a unique last identifier. For example, unique last identifiers can be one or

more letters and/or numbers. The last identifier identifies the template last that was used in developing the custom last and the customer associated with the custom last. An example of a last identifier for a particular customer, Mary Jones, could be 5 B67MJ. Based on this last identifier, system 100 would know that the customer is Mary Jones due to the initials MJ in the identifier, that she has chosen a sandal with a 90mm heel since the letter B was previously assigned to identify such lasts and that her data\measurements stored in memory unit 150 and/or 10 memory unit 135 are referenced by numeral 67.

Such information is later used in order to retrieve custom lasts associated with a particular customer. This data is stored in the customer's personal data file or in association therewith in memory unit 150. Lasts can be stored digitally 15 and/or physically stored by last manufacturer 115 or at main facility 110 for future reference. The customer last data can also be transmitted to processing unit 130 for storage in memory unit 135.

The physical custom lasts 805 manufactured by last 20 manufacturer 115 are thereafter sent to shoe manufacturer 120. Accordingly, the pair of custom shoes are manufactured by shoe manufacturer 120, in 335. In an exemplary embodiment, in order to manufacturer the custom shoes, the pattern of the

corresponding shoe style is modified by shoe manufacturer 120 according to the custom last measurements and material(s) selected by the customer. The pattern can be adjusted manually and/or using a CAD software program. Thereafter, the custom 5 shoes are picked up by or shipped to the customer.

In an alternative embodiment of the present application, scanning unit 140 and processing unit 145 determine the measurements of a volunteer's feet and based on those measurements using software application(s) stored in memory unit 10 150 are operable to automatically adjust the elevation of the last heel from a flat position. More particularly, scanning unit 140 and processing unit 145 determine the appropriate measurements for a pair of test shoe template lasts from the scan data regardless of the desired heel height and/or toe style 15 for the pair of test shoes. Upon adjusting the heel height, processing unit 145 either increases or decreases the other measurements associated with the template lasts. Thus, no need exist for referring to measurements associated with a particular base last. Similarly, a scanning unit and a processing unit 20 determine the measurements of a customer's feet and based on those measurements are operable to automatically adjust the elevation of the heel from a flat position. For example, if a customer chooses a shoe having a 90mm heel, but only data

regarding a last having a 120mm heel is stored in an associated memory unit, the processing unit can develop the appropriate custom lasts.

The embodiments described above are illustrative examples 5 of the present application and it should not be construed that the present application is limited to these particular embodiments. Various changes and modifications may be effected by one skilled in the art without departing from the spirit or scope of the invention as defined in the appended claims.